

Near-Slope changes in the Eurasian and Makarov Basins from glider surveys

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Award Number: N00014-15-1-2636

<http://www.uaf.edu/sfos/people/faculty/detail/ndex.xml?id=73>

LONG-TERM GOALS

To conduct high-latitude glider surveys that will lead to i) enhanced autonomous observational capabilities in the high Arctic, with focus on ii) diapycnal fluxes of heat and salt which may have significant influence on the upper water column and sea ice, and iii) provide direct measurements of the dissipation rate of turbulent kinetic energy. This is an important and critically undersampled parameter for numerical modeling of the coupled ice-ocean system.

OBJECTIVES

To enhance the observational capabilities in the high Arctic by integrating and utilizing direct microstructure turbulence and current measurements onto existing AUV gliders as part of the large-scale NABOS program.

APPROACH

The project approach is to integrate a microrider turbulence package on a 1000-m G2 Teledyne Webb glider. The integration consists of a cradle for the Microrider and a through-hull MCDC connector that allows power to be supported to the Microrider from the glider. The Microrider is a small instrument package for detailed turbulence microstructure measurements. It is internally recording (4 GB compact flash card), 1000-m depth rated and can house up to five turbulence sensors (e.g. 2x SPM microstructure turbulence shear probes, 2x FP07 microstructure fast thermistors and 1x SBE7 microstructure conductivity sensor). The Microrider has the same high-fidelity low-noise signal conditioning as the well-used free-falling VMP microstructure instrument using a signal plus derivate technique. The instrument is equipped with two highly sensitive pressure sensors, 2x accelerators and 2x tilt sensors to monitor instrument vibration and vehicle orientation. The Microrider samples all channels at a constant 512 Hz rate, and is neutrally buoyant in seawater, which allows for efficient and precise ballasting of the glider vehicle. The lithium-battery powered G2 gliders will also be equipped with a pumped Seabird GPCTD, a WetLabs ECO-triplet, providing optically-based estimates of Chlorophyll-a, colored dissolved organic matter (CDOM) and turbidity.

WORK COMPLETED

The ONR grant (Award Number: N00014-15-1-2636) was received and keyed at UAF on August 9, 2015. We have since been in contact with Teledyne Webb and Rockland Scientific regarding placing an order for a turbulence package, Microrider (see, <http://www.rocklandscientific.com/Products/ModularSystems/MicroRider/tabid/133/Default.aspx>), and its integration at Webb in MA on one of our labs 1000-m G2 Slocum gliders. We have also ordered and received the high-frequency (1 MHz) Aquadopp ADCP from Nortek.

RESULTS

We have initialized orders for the Microrider instrument and received the Nortek ADCP instrument.

IMPACT/APPLICATIONS

Our proposed activities are driven by objectives that underline the need for technologically new approaches for developing a comprehensive, quantitative understanding of the role of the upper ocean and halocline in regulating heat and freshwater fluxes in the EB/MB system, toward improved predictions of the role of the ocean in a new, seasonally ice-free Arctic which will offer potential for advancement and improvement of Navy and Marine Corps operations. We focus our project “*on improving Navy and Marine Corps understanding of environmental evolution ... by planning, fostering and encouraging scientific inquiry and technological development in fields ranging from littoral geosciences to high latitude dynamics.*” In combination with ship-based multidisciplinary surveys, the proposed observations will quantify upper ocean fluxes and their impacts on sea ice, lateral shelf-basin exchanges and mechanisms of halocline water formation. Improved understanding of mechanisms of oceanic mixing will be utilized by modelers partnering with us under on-going and future NSF and NOAA projects.

RELATED PROJECTS

No current projects that are closely related.